

REMARKS

Claims 1 through 6 and 11 through 16 remain pending in this application. In response to the Office Action, dated June 26, 2002, the specification and claims 1, 5, 13 and 14 have been amended and claims 6 through 10, and 17 through 21 have been cancelled. Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE." Care has been taken to avoid the introduction of new matter.

Favorable reconsideration of the application as now amended is respectfully solicited.

Objection has been made to the specification at paragraph 2 of the Office Action. In response, the phrase "axial air gap" at page 1, line 11 has been changed by amendment herein to read --radial air gap--. Withdrawal of the objection is respectfully solicited.

Objection has been made to the drawings at paragraph 1 of the Office Action for failing to illustrate winding energization in accordance with a preset sequential, non-sequential or random excitation scheme. In addition, claims 17 through 21 were rejected under the first paragraph of 35 U.S.C. §112 based on the same recitation. As these claims have been cancelled, the objection and rejection are now moot. Withdrawal of the objection is respectfully solicited.

Claims 1, 3, 5 through 9 and 11 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. patent 4,754,207 (Heidelberg), as set forth in paragraph 4, at pages 2-4 of the Office Action. Claims 2, 12 through 15 and 17 through 21 were rejected under 35 U.S.C. §103 as being unpatentable over Heidelberg in view of U.S. patent 5,015,903 (Hancock). The rejection is set forth at length in paragraph 5 of the Office Action, spanning pages 4-9 of the Office Action. It is noted that page 6 describes patents to Li

and Forbes although these patents were not identified in the statement of the rejection. While it is believed, for reasons discussed in detail below, that the rejection has been overcome, it is respectfully urged that if reliance upon these references is maintained then the next Office Action clearly state grounds of rejection.

Claim 16 was rejected under 35 U.S.C. §103(c) as being unpatentable over Heidelberg in view of Hancock and U.S. patent 6,278,216 (Li). The rejection is set forth at pages 10 and 11 of the Office Action. Claim 4 was rejected under 35 U.S.C. §1103(a) as being unpatentable over Heidelberg in view of Li as stated in paragraph 6 of the Office Action.

It is urged that the remaining claims as now amended patentably distinguish from the applied references. Independent claim 1 as now amended recites, *inter alia*, the following:

. . . the (stator) electromagnet poles having pole faces separated from each other by gaps, gaps between pole faces within each group being of a substantially uniform first angular distance; and . . . a plurality of (rotor) permanent magnets substantially equidistantly distributed with alternating magnetic polarity along the angular extent of the air gap and separated from each other by gaps of a second angular distance different from the first angular distance

All claims stand rejected either for anticipation by Heidelberg or for obviousness over Heidelberg as the primary reference. Heidelberg discloses in Figs. 1 and Figs. 5a-5b embodiments in which all adjacent permanent magnets 8 are in contact with each other. No gaps are provided between the magnets as required by that portion of claim 1 copied above, nor does the specification describe any modification of those embodiments that would provide such an arrangement. The Heidelberg embodiment illustrated in Fig. 3 includes magnets on the stator 6, not on the rotor, as required by claim 1. Moreover, the

magnets are not substantially equally distributed along the air gap nor uniformly separated by a gap. The embodiments of Figs. 4a-4c of Heidelberg disclose gaps between magnets that are of the same distance as the separation between electromagnet poles within each group. These embodiments are not arranged with, nor is there suggestion of, gaps between stator poles within each group being of a first dimension the gaps between magnets being of a second, different, dimension as required by claim 1.

It is well settled that anticipation, under 35 U.S.C. § 102, requires that each element of a claim in issue be found, either expressly described or under principles of inherency, in a single prior art reference. *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 USPQ 781 (Fed. Cir. 1983); *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 9 USPQ2d 1920 (Fed. Cir. 1989) *cert. denied*, 110 S.Ct. 154 (1989). The term "anticipation," in the sense of 35 U.S.C. § 102, has acquired an accepted definition, *i.e.*, "the disclosure in the prior art of a thing substantially identical with the claimed invention." *In re Schaumann*, 572 F.2d 312, 197 USPQ 5 (CCPA 1978). To satisfy the burden of establishing a basis for denying patentability under 35 U.S.C. §102, therefore, each and every element of claim 1 and its dependent claims must be shown by the Office Action to be disclosed in Heidelberg. As Heidelberg has not been shown to, and in fact does not, disclose the subject matter of now amended claim 1, it is respectfully urged that the rejection of claims 1, 3, 5, 6 and 11 for anticipation by Heidelberg under 35 U.S.C. §102(b) is now untenable and should be withdrawn.

With respect to 35 U.S.C. §103, legal precedent is well developed on this subject. As stated in *Graham v. John Deere Co.* 383 U.S. 1, 13, 148 USPQ 459, 465 (1966), obviousness under 35 U.S.C. §103 must be determined by considering (1) the scope and

content of the prior art; (2) ascertaining the differences between the prior art and the claims in issue; and (3) resolving the level of ordinary skill in the pertinent art. The PTO is thus charged with the initial burden of identifying a source in the applied prior art for: (1) claim features; and (2) the realistic requisite motivation for combining applied references to arrive at the claimed invention with a reasonable expectation of successfully achieving a specific benefit. *Smith Industries Medical Systems v. Vital Signs*, 183 F.3d 1347, 51 USPQ2d 1415 (Fed. Cir. 1999). This burden is not met if there is no showing that the combination of references would actually meet all the limitations of the claims under consideration.

An Office Action rejection must provide a reason why one having ordinary skill in the art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 227 USPQ 657 (Fed. Cir. 1985); *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *In re Warner*, 379 F.2d 1011, 154 USPQ 173 (CCPA 1967). The examiner should recognize that even if the prior art *could* be modified so as to result in the combination defined by the claims the modification would not have been obvious unless the prior art suggested the desirability of the modification. *In re Deminski*, 796 F.2d 436, 230 USPQ 313 (Fed. Cir. 1986). In the absence of such a prior art suggestion for modification of the references, the basis of the rejection is no more than inappropriate hindsight reconstruction using appellant's claims as a guide. *In re Warner*, 379 F.2d 1011, 154 USPQ 173 (CCPA 1967).

What may or may not be known in general does not establish the requisite realistic motivation to support the ultimate legal conclusion of obviousness under 35 U.S.C. §103. *In re Deuel*, 51 F.3d 1552, 34 USPQ2d 1210 (Fed. Cir. 1995). The requisite motivation is not an abstract concept, but must stem from the applied prior art as a whole and have realistically impelled one having ordinary skill in the art, at the time the invention was made, to modify a reference in a specific manner to arrive at a specifically claimed invention with a reasonable expectation of achieving a specific benefit. *In re Newell*, 891 F.2d 899, 13 USPQ2d 1248 (Fed. Cir. 1989). It is submitted that the prior art does not meet these criteria for the remaining claims 1 through 5 and 11 through 16 as amended.

The amendment to claim 1 incorporates therein subject matter recited originally in now cancelled claim 10. Claim 10 was rejected at paragraph 7 of the Office Action, nominally as being unpatentable over Heidelberg in view of Li under 35 U.S.C. §103(a). However, Li otherwise has not been discussed in the description of that rejection. Instead, the Office Action describes Fig. 1 of Forbes (first full paragraph at page 10) as disclosing rotor pole faces separated by gaps that are different from gaps between adjacent stator pole faces within a stator group. Applicant assumes, albeit through speculative consideration of this portion of the Office Action, that it was the intention of the Examiner to base the conclusion that it would have been obvious to modify Heidelberg in light of the Forbes, not Li, disclosure.

Favorable reconsideration of this holding is respectfully solicited. While Forbes describes in considerable detail the manner of constructing the motor, there is no description in the specification of the relative dimensions of the gaps between adjacent

rotor magnets vis-à-vis the gaps between adjacent stator pole faces. These spacings are shown in Fig. 1. There is no statement or suggestion in the specification that the dimensions shown in the drawing represent exact relationships or that there is any reason for, or benefit from, the dimension of the gap between adjacent rotor magnets being different from the dimension of the gap between adjacent stator pole faces. In this regard, Fig. 1 thus is merely a general illustration of structure for which there is no particular discussion in the specification.

While the specification contains considerable specific description of the motor construction, none of the description is directed to the dimensions of the gaps between elements. As examples: column 10, lines 22-31, describe the elements secured in preselected located positions on the rotor; lines 41+, state that the magnets are disposed for selective magnetic coupling with the windings on the stator pole pieces; lines 63+ state that the magnets may be adhered to the inner circumferential surface in preselected arcuately spaced apart located positions thereabout. Column 10, lines 46-51 identify twenty-four salient stator poles and sixteen magnet rotor elements but contemplates that a different number of salient poles and permanent magnets may be utilized. All of this description is applicable to location of the magnets on the rotor and the number of magnets and stator poles. This description is silent, and is not suggestive, as to the dimensions of the gaps between magnets and the gaps between stator pole faces. All of the descriptive examples referenced above may be equally applicable whether the magnet gaps and the stator gaps are of the same or different dimensions. For example, the gap dimensions can be made to vary by changing the circumferential extent of the magnets

and the stator pole faces, while complying with the descriptions of the above examples.

(Li, also, is silent as to any reason for setting the gaps at particular dimensions.)

It is submitted that the general illustration of Fig. 1 of Forbes, without attribution of a benefit derived from the gap dimensions shown, would not have motivated an artisan to modify the disclosed Heidelberg structures to comply with the gap dimensions required by claim 1. Whether or not Heidelberg *could* be so modified is not dispositive of the issue. There is nothing that would have impelled the artisan to undertake such a modification as the references would not have engendered in a person of ordinary skill in the art any expectation of benefit to be derived therefrom that is not already provided from the Heidelberg structure in its disclosed, unmodified configurations. Rather, the artisan would have been faced with reconstructing the Heidelberg machine for no apparent benefit. Thus the rejection of claim 10 for obviousness under 35 U.S.C. §103 in light of Heidelberg and Forbes and/or Li, imposed in the Office Action, is not appropriate under the precedents cited above for claims 1, 3, 5, 6 and 11.

Moreover, it is urged that additional factors mitigate against such a rejection. Heidelberg describes a problem (columns 1 and 2) of transformer effect that leads to "disturbing reactions" upon switching adjacent stator electromagnet windings at different times. These effects are addressed by dividing the stator core into separate groups of poles with precise interdimensional relationships. In each of the disclosed embodiments, the particular stator pole configuration is related, based upon addressing the described problem, to the particular rotor magnet arrangement shown. The plurality of stator poles, the differences in specific pole shapes within each group, the spacings between groups

and between poles within groups, are all defined to avoid cogging torque effects that can occur from switched energization of the stator windings.

Both Forbes and Li embody continuous stator cores that are not structurally divided into groups. These references are not concerned with the problem disclosed by Heidelberg. It is submitted that an arbitrary modification of the Heidelberg structures to provide unequal gap dimensions as required by claim 1, as proposed in the Office Action, would require a major reconstruction of the Heidelberg structure beyond the embodiments disclosed to retain the objectives to which Heidelberg is directed. That is, an artisan would have been presented with a problem to avoid destroying the intended operation of the Heidelberg motor by the arbitrary provision of the claimed dimensional relationships.

As there is no prior art teaching or suggestion of the torque signature benefits obtained in the present invention that are derived from magnet gap dimensions and stator pole face gaps recited in claim 1 and its dependent claims, it is submitted that these claims are patentably distinguishable. Dependent claim 5 adds the further requirement that the angular distance of the gaps between adjacent pole faces of each stator group differs from the angular distance of the gaps between adjacent stator pole faces of adjacent groups. Claim 6, dependent from claim 5, further requires that the angular distance of the gaps between adjacent poles of adjacent stator groups is different from the angular distance of the gaps between adjacent permanent magnets of the rotor. Thus three different gap dimensions are required, respectively for the magnet gap, the pole face gaps within the stator groups and the pole face gaps between the stator groups.

Claims 2 and 12 through 15 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Heidelberg in view of Hancock. With respect to claim 2, Hancock was relied upon for its disclosure of stator groups having a single pair of poles wound to provide poles of opposite magnetic polarity. The Office Action states, at the third paragraph of page 5, that it would have been obvious "to modify [the Heidelberg structure] by forming groups comprising a single pair of poles . . . for the purpose of preventing flux reversal between stator poles." A similar reason is propounded for concluding that it would have been obvious to modify Heidelberg to provide an odd number of stator groups each having an even number of poles, as required by claim 12.

Frankly, this stated purpose is not understood. Applicant can find no reason why a person of ordinary skill in the art would have found a need to prevent flux reversal between stator poles of the Heidelberg arrangements. The Office Action does not define a flux reversal problem nor identify any teaching in the references that would have suggested such modifications. Moreover, is it submitted Heidelberg teaches away from the modification proposed in the Office Action as it would destroy the objectives to which the specifically illustrated embodiments are directed: overcoming the "disturbing reactions" and cogging effects caused by interaction of electromagnet poles with permanent magnets.

In addition, it is submitted that claims 2 and 12 depend from claim 1, which has been amended herein to further require the magnet gap and stator pole face gap dimensions described above. Hancock, of course, which has not been relied upon for teaching such features, is a reluctance motor and would provide no teaching as to spacing of rotor magnets. It is noted, also, that the spacing between the poles of a stator

electromagnet pole pair appears to be the same as the spacing between the reluctance poles of the rotor. Therefore, it is submitted that claims 2 and 12, for at least the above stated reasons, patentably distinguish from the prior art.

With respect to claims 13 through 15, it appears that the grounds of rejection inadvertently were not accurately described in the first sentence of paragraph 5 of the Office Action. Apparently Forbes and, perhaps, Li, as well as Hancock, have been relied upon for describing the rejection of claim 13. The Forbes disclosure of individually securing each stator pole 67 into ring 93 (Fig. 1) has been relied upon to conclude that it would have been obvious to modify Heidelberg in an undescribed manner to form individual pole pair groups and secure them to an annular ring structure.

Claim 13 is dependent from claim 1 and has been amended to require that each stator group is individually secured to a non-magnetically permeable support structure, thereby facilitating independent removal and replacement of an individual stator group and a switched energization circuit component associated therewith. It is urged that claim 13 patentably distinguishes from the prior art for those features included from parent claim 1, discussed above, as well as for its additional recitation. While the individual stator poles of Forbes may be relatively readily securable into the stator ring, the stator ring comprises the same as or similar permeable material to stator poles, thereby serving to channel flux. Moreover, modification of the Heidelberg structure for pole insertion into support structure in the manner of Forbes as proposed by the Office Action would have presented the artisan with considerable problems of construction. The method of construction of Forbes that is the basic concept of the Forbes disclosure would have to be substantially changed. For example, Forbes forms the ring 93 by winding a

thin strip of ferromagnetic material into a plurality of helical convolutions that are then bonded into a laminated structure (column 5). The notches for insertion of the stator poles are formed at regular intervals in the elongated strip before the wound laminated structure is formed. Heidelberg, however does not have a continuous ring of ferromagnetic material at the base of the stator poles; the separation of stator core sections is critical to the Heidelberg invention. Further, the stator poles of Heidelberg are not uniformly located around the stator circumference. It is submitted that a person of ordinary skill in the art aware of these differences, if anything, would have been led away from the modification proposed in the Office Action. Moreover, after the stator poles of Forbes have been secured in the ring, there is no basis for concluding that the Forbes configuration provides the recited feature of claim 13 for facilitating independent removal and replacement of an individual stator group. That is, it does not appear that a stator pole of Forbes after being secured to the ring can be easily removed and replaced. For all the above reasons, it is submitted that claim 13 is patentably distinguishable from the prior art. Claims 14 and 15, which are dependent from claim 13 and add further requirements, are patentably distinguishable at least for the same reasons.

Claim 4 has been rejected under 35 U.S.C. §103 as being unpatentable over Heidelberg in view of Li. Li has been relied upon in the Office Action, not for teaching the features of parent claim 1, but for its disclosure of the use of a resolver as a rotor position detector. It is submitted that claim 4 is patentably distinguishable from the prior art because, even if Heidelberg were to be modified to incorporate a resolver, the gap dimensions required by claim 1, as discussed above, would not have been suggested by the prior art teachings for inclusion in the modification.

Claim 16 has been rejected under 35 U.S.C. §103 as being unpatentable over Heidelberg in view of Hancock and Li. Claim 16 is dependent from claim 13. The statement of the rejection is confusing as it appears that it was the intention of the examiner to apply Forbes and there is no description in paragraph 8 explaining reliance on Hancock. Forbes is described in the Office Action as disclosing the rotor spaced from the axis of rotation for the purpose of mounting the rotor directly to the wheel of a bicycle. Applicant can find nothing in the Forbes disclosure that suggests mounting the rotor to a wheel of a bicycle. Li, which does disclose a bicycle, apparently has been relied upon for disclosing a rotor housing journaled for rotation about the shaft through bearings.

Notwithstanding the confusion inherent in the statement of the rejection of the Office Action, it is submitted that claim 16 is patentably distinguishable from the prior art at least for the requirements of its parent claims 1 and 13. Rather than repeat the arguments made above with respect to the rejections of those claims, reference is made to those arguments to avoid needless redundancy.

In summary, each of the now pending claims 1 through 6 and 11 through 16, has been shown above to be patentably distinguishable from the prior art. Allowance of the application is respectfully solicited. To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in

connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

MCDERMOTT, WILL & EMERY

A handwritten signature in black ink, appearing to read "Gene Z. Robinson". The signature is fluid and cursive, with a long horizontal stroke at the end.

Gene Z. Robinson
Registration No. 33,351

600 13th Street, N.W.
Washington, DC 20005-3096
(202)756-8000 GZR:lnm
Facsimile: (202)756-8087
Date: July 29, 2002

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

At page 1, replace the paragraph beginning at line 9 with the following:

The present invention relates to rotary direct current electric motors, more particularly to motors having first and second annular ring members concentrically arranged about an axis of rotation and separated from each other by [an axial] a radial air gap, one of the members comprising separate magnetically isolated wound electromagnetic pole groups.

IN THE CLAIMS

1. (Amended) A rotary electric motor comprising:

a stator configured in the form of an annular ring having a plurality of groups of electromagnet poles, the groups substantially equidistantly distributed along the angular extent of the annular ring, each of the groups comprising magnetic material magnetically isolated and separated from the other groups, the electromagnet poles having pole faces separated from each other by gaps, gaps between pole faces within each group being of a substantially uniform first angular distance; and

an annular rotor, concentric with an axis of rotation and concentric with the annular stator to form a radial air gap therebetween, comprising a plurality of permanent [magnet poles] magnets substantially equidistantly distributed with alternating magnetic polarity along the angular extent of the air gap and separated from each other by gaps of a second angular distance different from the first angular distance, the permanent [magnet poles] magnets having a common magnetic return path;

wherein each group of electromagnet poles comprises windings that are switchably energized for driving electromotive interaction between the stator and rotor.

5. (Amended) A rotary electric motor as recited in claim 1, wherein the angular distance of the gaps between [poles] adjacent pole faces of each stator group [is substantially uniform throughout the periphery of the stator and] differs from the angular distance of the gaps between adjacent stator [poles] pole faces of adjacent groups.

6. (Amended) A rotary electric motor as recited in claim 5, wherein the angular distance of the gaps between adjacent poles of [each] adjacent stator [group] groups is [independent of] different from the angular distance of the gaps between adjacent permanent [magnet poles] magnets of the rotor.

13. (Amended) A rotary electric motor as recited in claim 1, wherein each stator group is individually secured [in the stator annular ring] to a non-magnetically permeable support structure, thereby facilitating independent removal and replacement of an individual stator group and a switched energization circuit component associated therewith.

14. (Amended) A rotary electric motor as recited in claim 13, wherein said [motor further] support structure comprises:

a plate member; and

a shaft member located at the axis of rotation;

wherein each of said stator groups is secured to said plate member at a spaced radial distance from the axis of rotation; and

said plate member is attached to said shaft member.